

Engineering With Nature

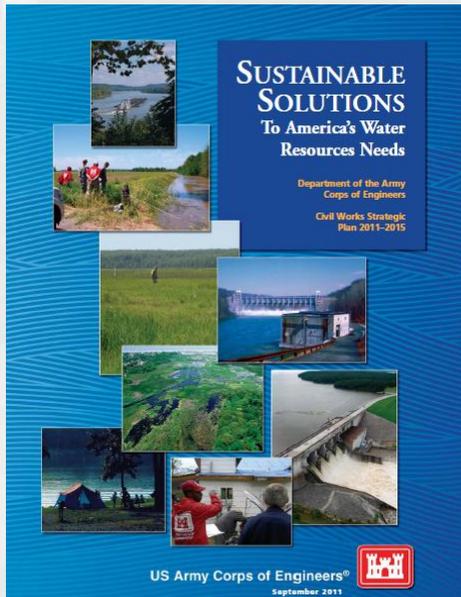
Cynthia J. Banks
Research Biologist/Program Manager
Engineer Research and Development Center

Cynthia.J.Banks@usace.army.mil



The Challenge

- Efficient, cost effective engineering and operational practices
- More collaboration and cooperation, less unproductive conflict.
 - ▶ Ports, commercial interests, regulators, NGOs, and others
- Sustainable projects. Triple-win outcomes integrating social, environmental and economic objectives.



Sustainable Solutions Vision: “Contribute to the strength of the Nation through innovative and environmentally sustainable solutions to the Nation’s water resources challenges.”

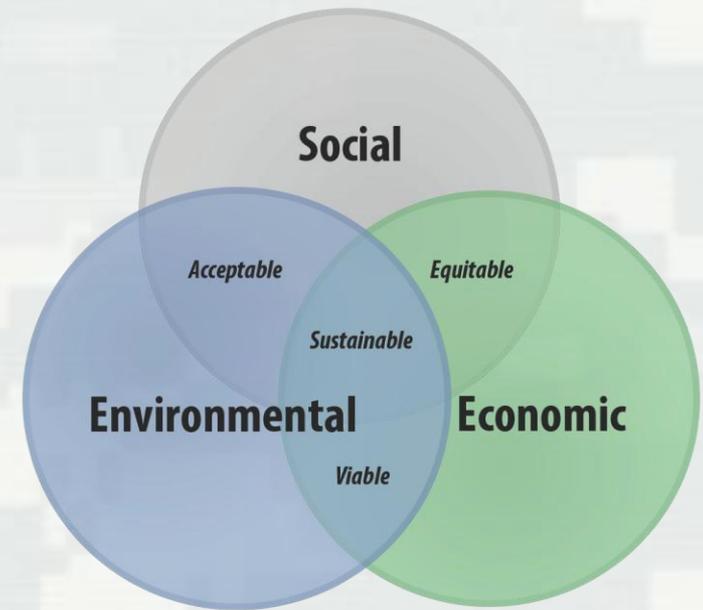


Engineering With Nature...

...the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes.

Key Ingredients

- Science and engineering that produces operational efficiencies
- Using natural process to maximum benefit
- Broaden and extend the benefits provided by projects
- Science-based collaborative processes to organize and focus interests, stakeholders, and partners



EWN Status

- *Engineering With Nature* initiative was started within the USACE Civil Works program in 2010. Over that period we have:
 - ▶ Engaged > 200 ind. across USACE Districts (23), Divisions, HQ; other agencies, NGOs, academia, private sector, international collaborators
 - Workshops (10), dialogue sessions, project development teams, etc.
 - ▶ Developed a strategic plan
 - ▶ Focused research projects on EWN
 - ▶ Initiated field demonstration projects
 - ▶ Begun implementing our communication plan



Example EWN Solutions

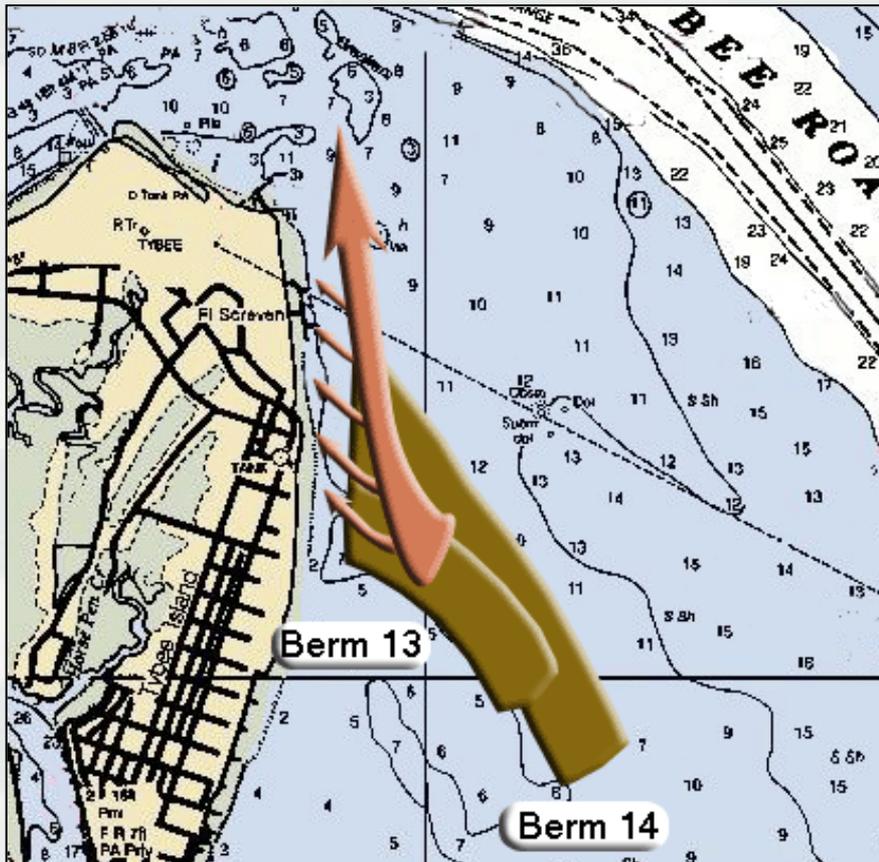


**Long-distance
pumping of
dredged material
for wetlands
creation in coastal
Louisiana, USA**

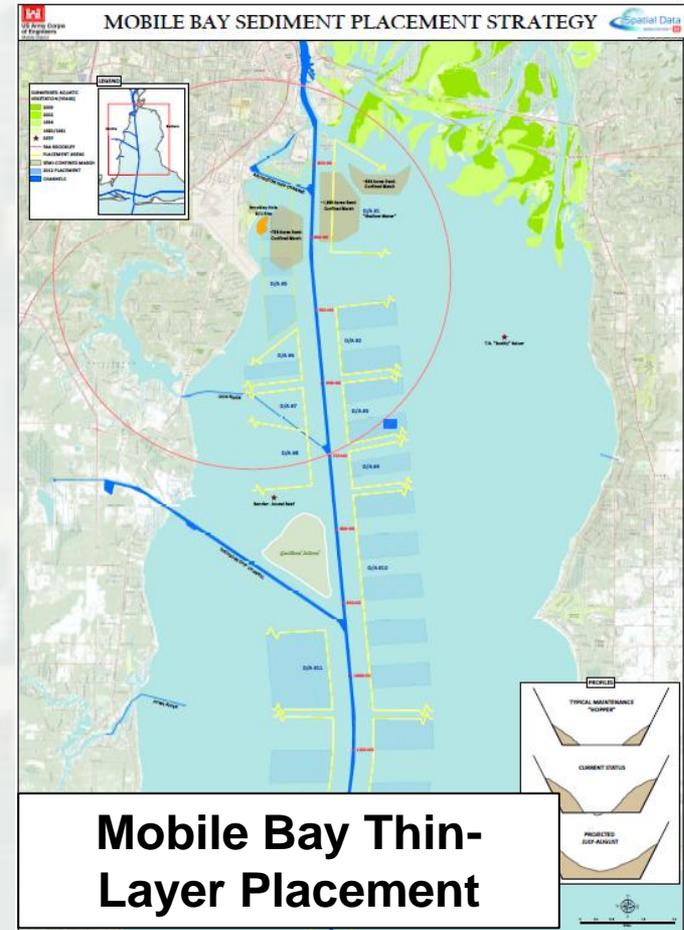
- *How to marry LDC
with natural transport
processes to expand
opportunities?*

Example EWN Solutions

Strategic Sediment Placement



**North Tybee Island
Savannah, Georgia**



Example EWN Solutions

Upper Missouri River Sandbar Habitat

- \$25 Million to construct 650 acres of sandbar
- 16,000 acres created by the flood of 2011

July 2009

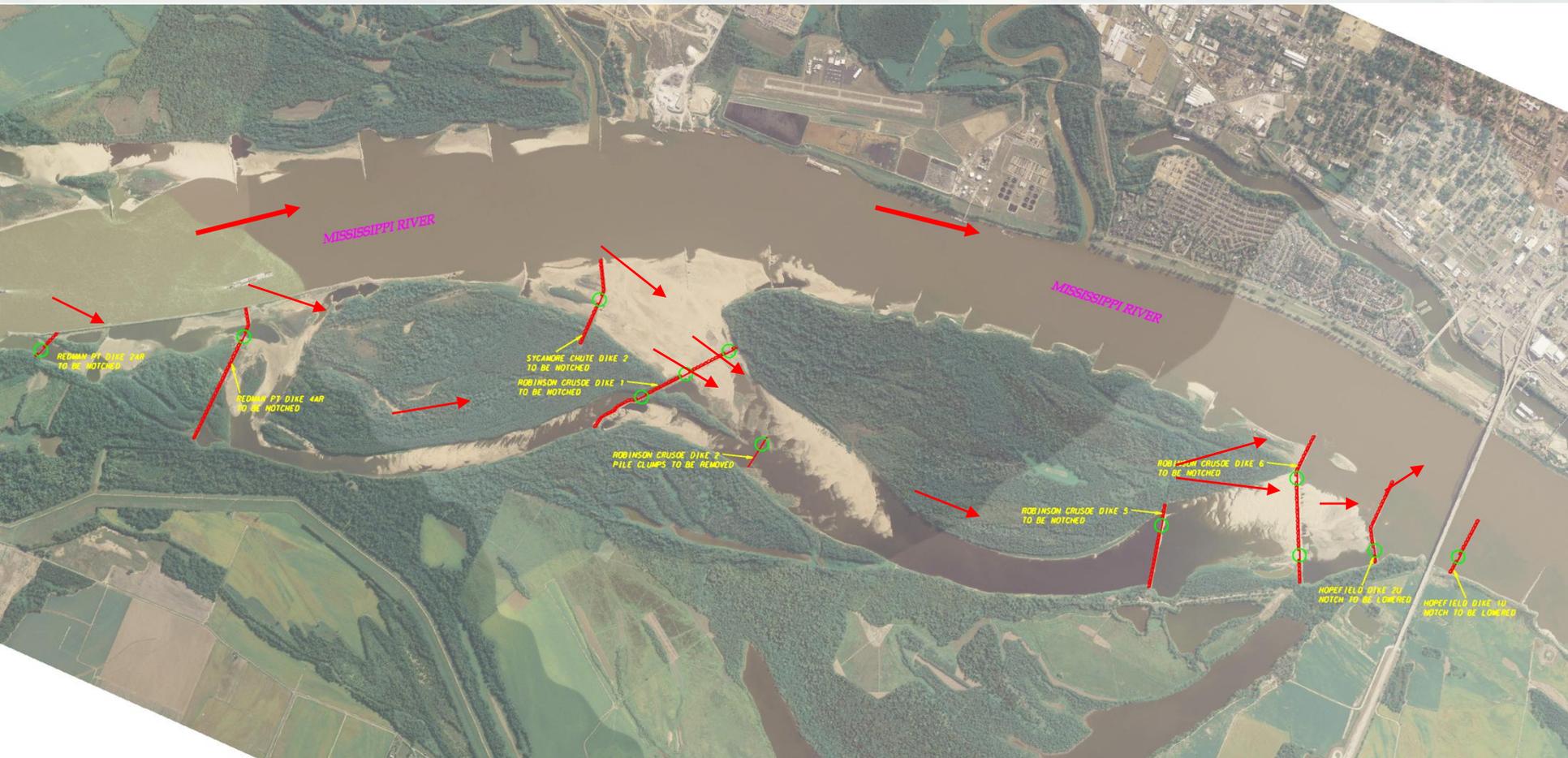


November 2011



Courtesy: G. Pavelka
COE, 2012

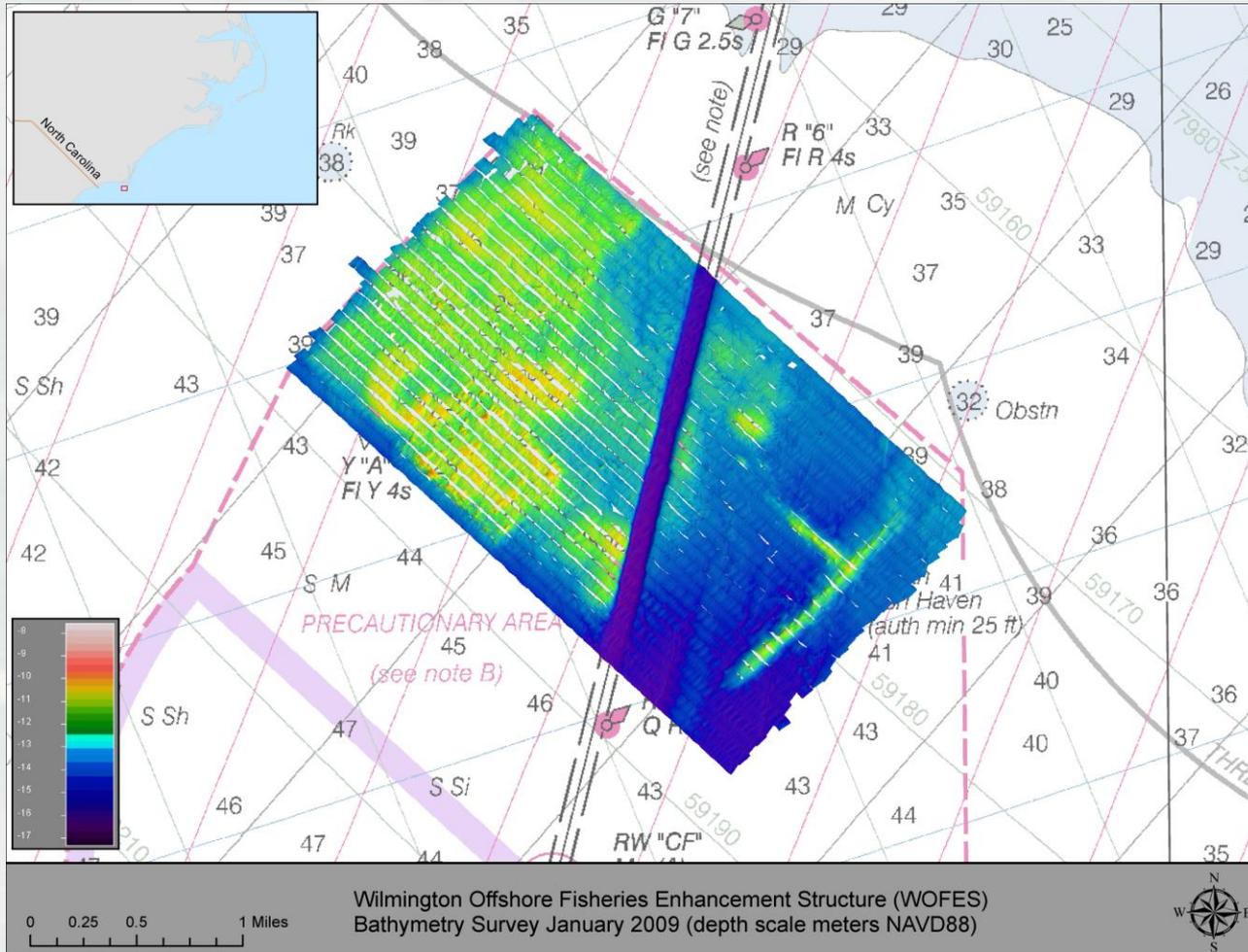
Example EWN Solutions



Loosahatchie Bar Aquatic Habitat Rehabilitation



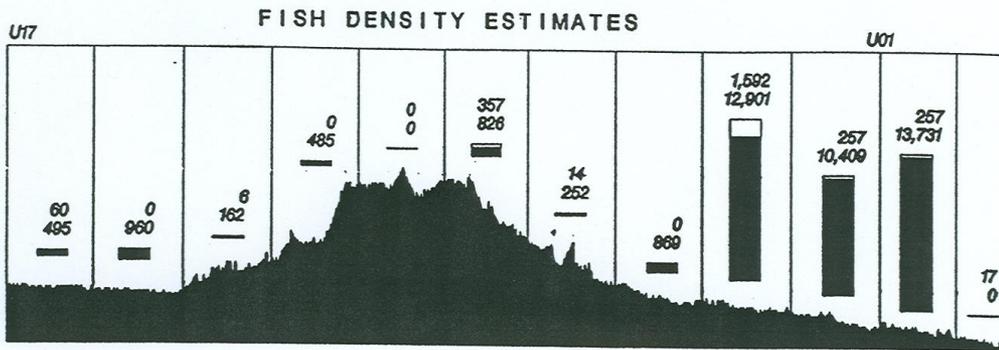
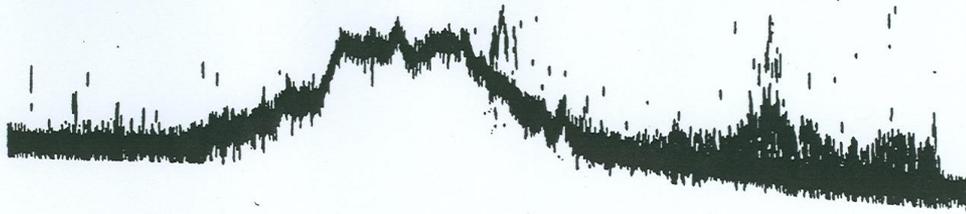
Example EWN Solutions



Wilmington Offshore Fisheries Enhancement Structure



Example EWN Solutions

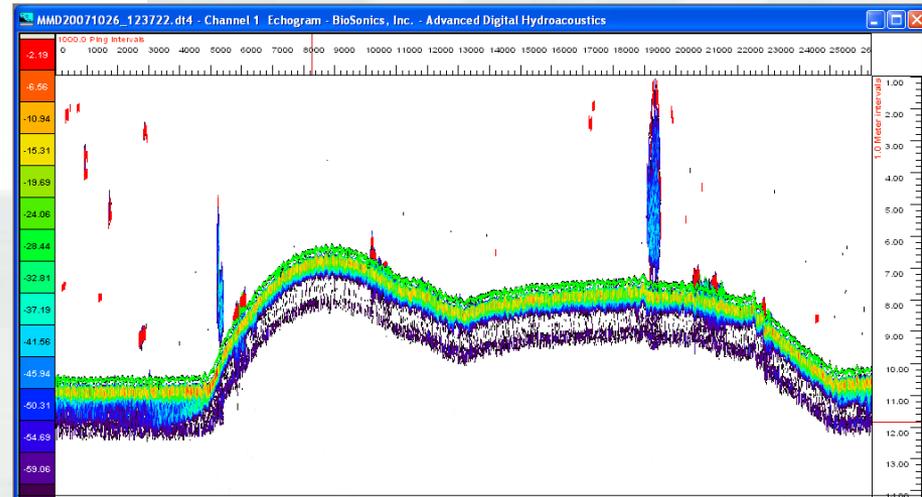


LEGEND

xxxx Density Of Mid-column Fish
yyyy Density Of Bottom Fish
 Histogram Of Fish Density in fish per hectare

Hydroacoustics and trawling data used to document fisheries benefits provided by topographic relief created with dredged material

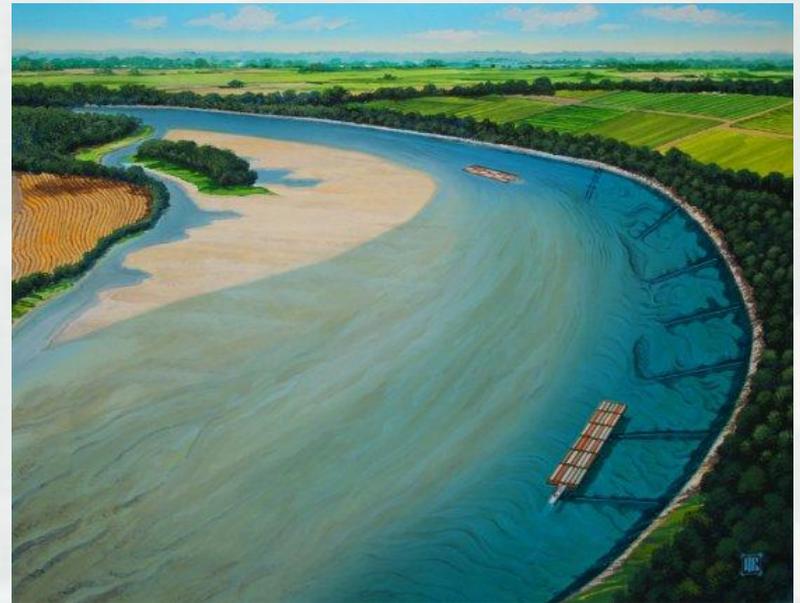
Mobile Offshore Dredged Material Mound



Example EWN Solutions



Upper Mississippi River Training Structures: Chevrons



River Bendway Weirs



Environmentally Enhanced Breakwater Toe Blocks

Example EWN Solutions

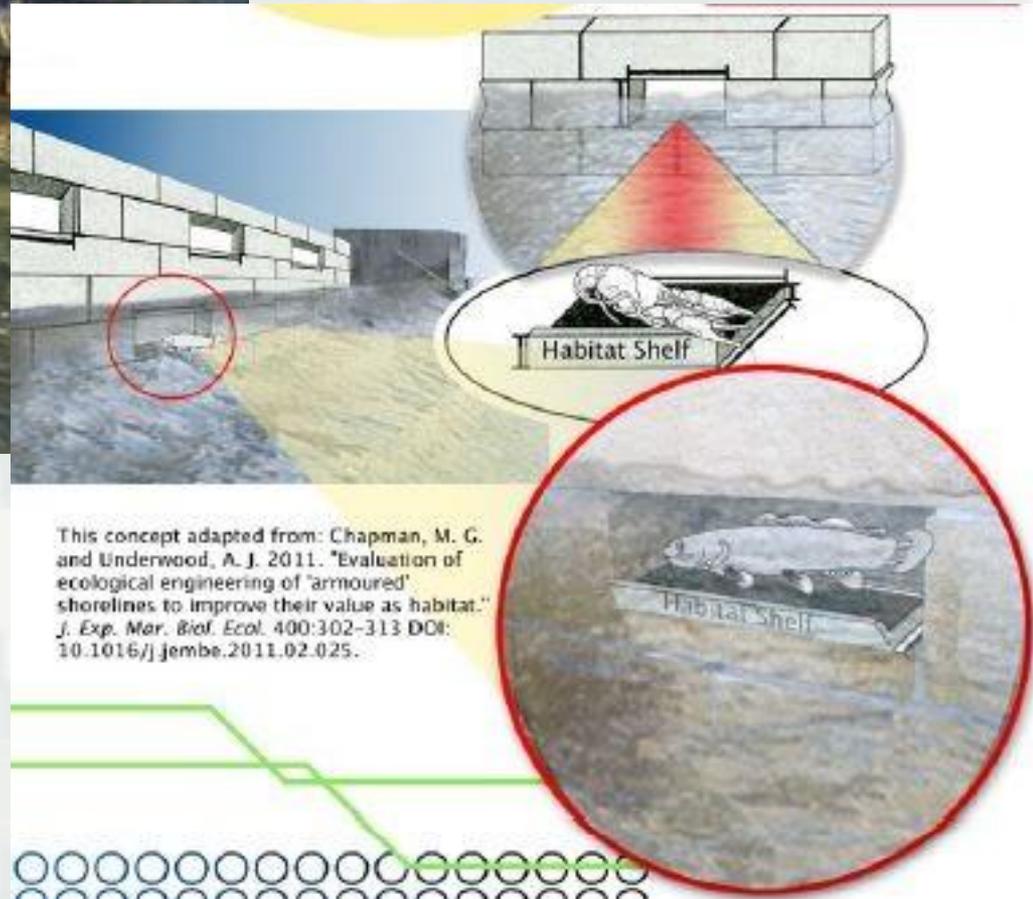


Seawall ½ Flower Pots

Seawall Habitat Shelves

Dr. Mark Browne

<http://youtu.be/iuDmTVHki40>



This concept adapted from: Chapman, M. G. and Underwood, A. J. 2011. "Evaluation of ecological engineering of 'armoured' shorelines to improve their value as habitat." *J. Exp. Mar. Biol. Ecol.* 400:302-313 DOI: 10.1016/j.jembe.2011.02.025.

EWN Action Projects

- Sediment Retention Engineering to Facilitate Wetland Development (San Francisco Bay, CA)
- Realizing a Triple Win in the Desert: Systems-level Engineering With Nature on the Rio Grande (Albuquerque, NM)
- Atchafalaya River Island and Wetlands Creation Through Strategic Sediment Placement (Morgan City, LA)
- Portfolio Framework to Quantify Beneficial Use of Dredged Material (New Orleans and New England)
- Engineering Tern Habitat into the Ashtabula Breakwater (Ashtabula, OH)
- Living Shoreline Creation Through Beneficial Use of Dredged Material (Duluth, MN)
- A Sustainable Design Manual for Engineering With Nature using Native Plant Communities



Research: EWN for Coastal Resilience

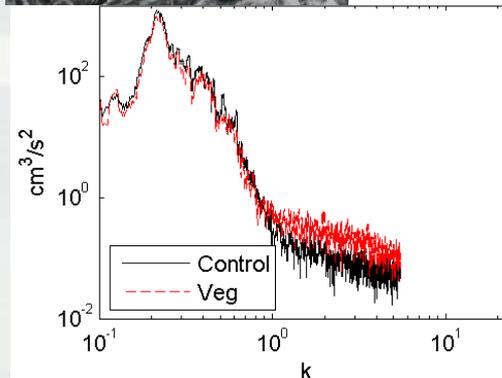
Research collaboration to improve the efficiency of engineering and operational practices, expand and extend project benefits, and improve the resilience and sustainability of coastal systems under climate change.

Field Research Activities:

- Wetland primary productivity
- Sediment processes
 - ▶ Cohesive sediment settling
 - ▶ Sediment resuspension
 - ▶ Marsh platform erosion

Laboratory Analyses:

- Transport in vegetation
- Wave energy transformation

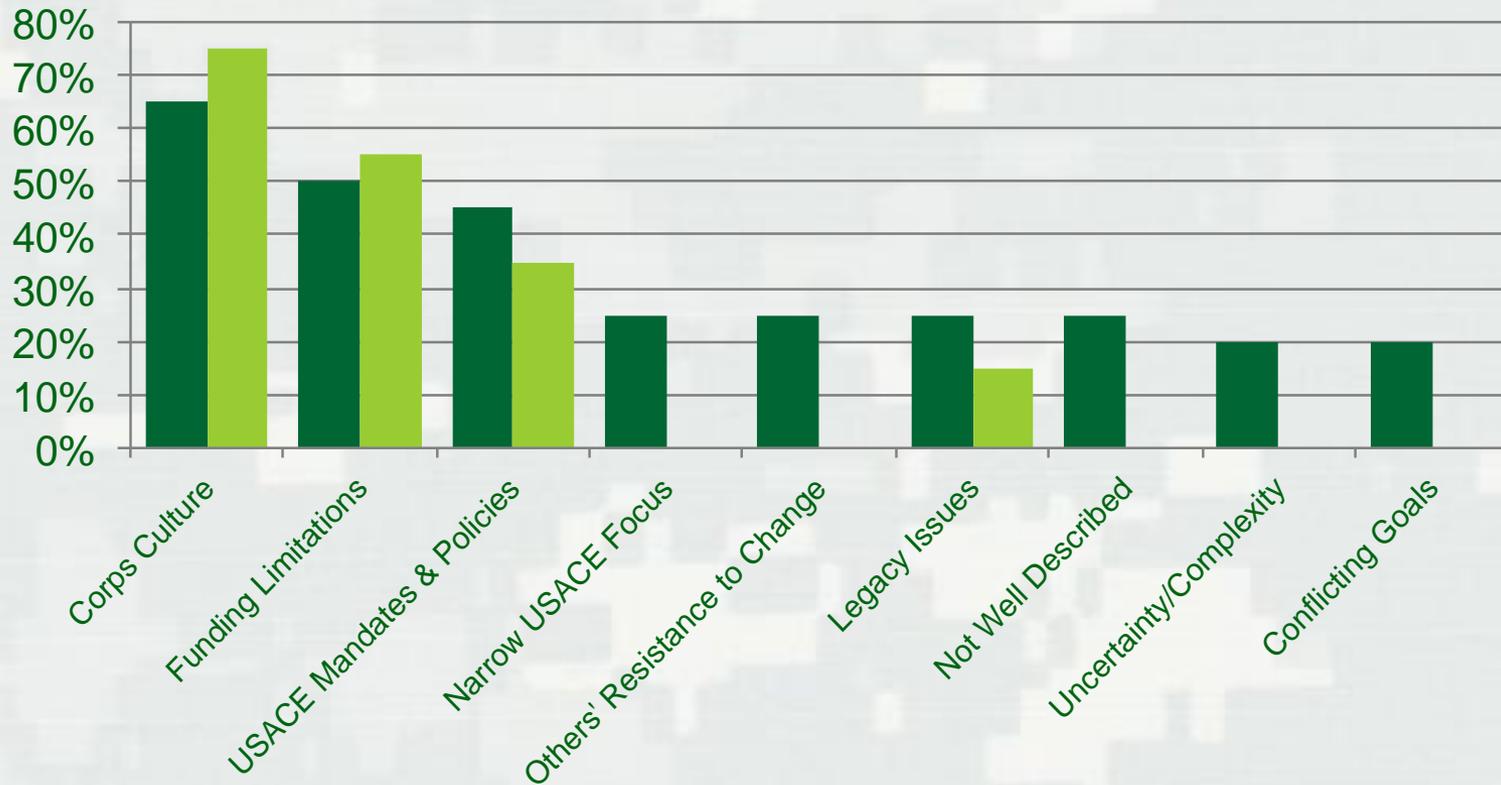


Dialogue Sessions on EWN

- 22 internal USACE stakeholders representing a diverse population across specialty areas and geography (averaging 56 minutes)
 - ▶ Specialty Areas: Senior Leadership, Research, Navigation, Flood Risk Management, Operations and Regulatory, Coastal, Planning, Environment, Water Resources
 - ▶ Geographical Areas: Washington DC, Mississippi, Florida, New York, Massachusetts, Texas, Oregon, Alabama, New Jersey, South Carolina, Nebraska
- 34 external stakeholders representing a diverse population of stakeholder types and geographical areas (averaging 37 minutes)
 - ▶ Stakeholder Types: Academia, Federal Government Agencies, State Government Agencies, Non-Governmental Organizations, Private Industry and European Experts with Related Expertise.
 - ▶ Geographical Areas: Those with responsibilities and expertise in coastal areas, rivers and lakes.



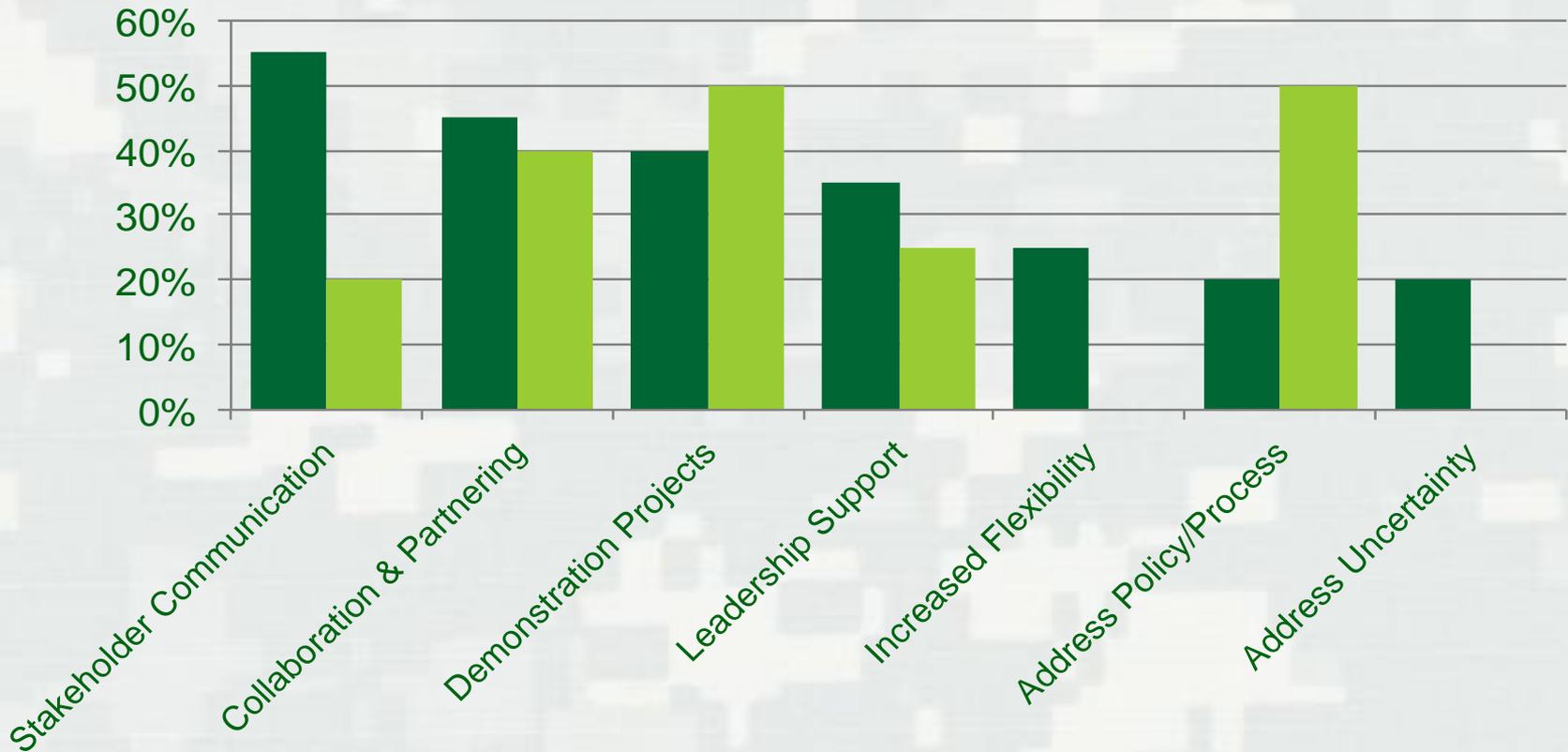
Barriers to EWN Adoption



External MM (n=34)
Internal MM (n=22) (Only common factors shown)



Overcoming Barriers to EWN

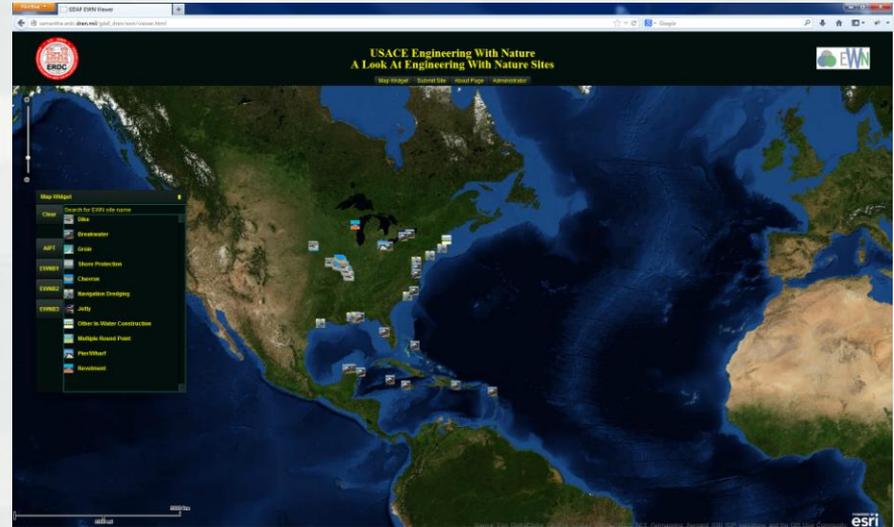


External MM (n=34)
Internal MM (n=22) (Only common factors shown)



EWN ProMap

- Online GIS database of projects illustrating EWN principles and practices
 - ▶ Illustrating the four key attributes of EWN
- Currently contains 120 projects
 - ▶ Name
 - ▶ Manager/Owner
 - ▶ Description
 - ▶ Infrastructure association e.g., jetty, breakwater, channel
 - ▶ Benefits e.g., fish habitat, bird habitat, recreation
 - ▶ Links, reports, photos
- Designed to facilitate communication about opportunities, lessons learned, and good practices
- Projects examples will be added through a process of self-nomination and independent evaluation





HOME ABOUT RESOURCES R&D TOOLS CASE STUDIES CONTACT US



WHAT IS ENGINEERING WITH NATURE?

Engineering With Nature (EWN) is an initiative of the U.S. Army Corps of Engineers (USACE) to enable more sustainable delivery of economic, social, and environmental benefits associated with water resources infrastructure. EWN directly supports USACE's "Sustainable Solutions to America's Water Resources Needs: Civil Works Strategic Plan 2011 - 2015" and contributes to the achievement of its Civil Works Mission and Goals.

EWN is the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental, and social benefits through collaborative processes.

UPCOMING EVENTS

25-28 AUG

Western Dredging Assoc. and Texas A&M University (WEDA/TAMU) Conference: Honolulu, Hawaii

WHAT'S NEW

Dr. Todd Bridges, Senior Research Scientist, describes how Engineering With Nature fits within the USACE Navigation mission.



FEEDBACK FROM OTHERS

'In the old days, the Corps would identify a problem and come up with a solution and approach fish and wildlife and its partners very late in the process after resources had been pretty much committed, especially in the design phase. But because it was so late in the process, there was never any discussion about alternatives and it was pretty much take it or leave it. Engineering With Nature allows us to get involved early and have the dialogue that is needed to try some non-traditional approaches that work.' Partner Agency



US Army Corps of Engineers

www.EngineeringWithNature.org
<http://el.erdc.usace.army.mil/ewn>



Engineering With Nature

- Expand the range of benefits provided through water-based infrastructure
 - ▶ Create value!
- Balancing consideration of environmental risks with project **benefits**
- A path to more sustainable projects



Point of Contact

Dr. Todd S. Bridges

Senior Research Scientist (ST), Environmental Science

Office: 601-634-3626

Todd.S.Bridges@usace.army.mil

